the good wish of that man, the hurry he was in, and the vast many heresay accounts he depended on.

Nov. 25th, 1821. Since I left Cincinnati I have finished 62 drawings of birds and plants, 3 quadrupeds, 2 snakes, fifty portraits of all sorts, and the large one of Father Antonio, besides giving many lessons and I have made out to send money to my wife sufficient for her and my Kentucky lads, and to live in humble comfort with only my talents and industry, without *one cent* to begin on.

THE EFFECT OF ALTITUDE ON BIRD MIGRATION.

BY WELLS W. COOKE.

SURROUNDED by mountains, Asheville, North Carolina, is situated in the valley of the French Broad River, at an altitude of two thousand feet. Directly east is Raleigh, at about three hundred feet above ocean level. This difference in altitude causes quite a difference in the climate of the two places; the average temperature at Raleigh is about 60° F., while at Asheville it is five degrees colder. The former is in the Austro-riparian life zone, the latter at the extreme upper limit of the Carolinian. A difference in the avifauna naturally follows these variations in climate. The higher altitude of Asheville prevents some birds from occurring there that are found in summer at Raleigh. Among these may be mentioned the Chuck-will's-widow, Blue Grosbeak, and the Prothonotary Warbler. In a larger number of cases, birds remain through the winter at Raleigh that are seldom if ever found at Asheville during this season. Examples of this class are the Swamp Sparrow, Chewink, Brown Thrasher, and Ruby-crowned Kinglet. These all appear at Asheville as spring migrants.

A few mountain-loving species are regular visitors at Asheville, but occur as rare stragglers only at Raleigh. The Baltimore Oriole is a striking example, and the same preference is shown by the Olive-sided Flycatcher and the Blackburnian Warbler.

As would be expected, spring migration is, on the whole, later at Asheville than at Raleigh, and the voluminous records of the Biological Survey furnish data for a quite exact statement of the amount of variation in the times of arrival at the two places. The late J. S. Cairns sent migration notes for the years 1890 to 1894, inclusive, from the town of Weaverville, ten miles distant from Asheville; Minot Davis recorded the dates of arrival of the birds at Asheville in 1899, and W. M. Rackett the same data for 1902 at Weaverville. These seven years of observation furnish a satisfactory basis for estimating the average dates of arrival in this district. From C. S. Brimley, at Raleigh, the Biological Survey has received a very full report on migration for eighteen years, from 1885, the whole forming, probably, the largest amount of migration data ever recorded by one person at any one locality in the United States. With this amount of material at command, the movements of the birds at Raleigh can be ascertained with great accuracy.

Twenty-one species of common birds arrive in the spring at Raleigh, on the average, 3.6 days earlier than at Asheville, or one day earlier for each 1.4° F. that Raleigh is warmer than Asheville. Most of these birds were migrating during April, and for this month the temperature of the two localities differs scarcely four degrees. Therefore, it can be said that with reference to these two localities spring migration is delayed one day for each degree of cold. This relation, of course, would not hold good for other localities, though the migration between Raleigh and Washington is not much different. During April Raleigh averages six degrees warmer than Washington, and the birds average eight days in making the journey of the two hundred miles between the two places, or one and a third days for each degree of temperature. The trip from St. Louis to St. Paul is performed at a rate of about a day and a half for each degree of difference in temperature.

These statements are the averages of such widely differing quantities that they cannot be used to ascertain even approximately the time that any particular species requires in its passage from one locality to another.

The following dates show how greatly the different species vary in the time of their arrival at the two places, Raleigh and Asheville.

Species.	Average of the first seen.		Difference. Days.
	Raleigh.	Asheville.	
Black and White Warbler	March 26	April 2	7
Blue Gray Gnatcatcher	" 26	March 28	2
Parula Warbler	April 9	April 16	7
Rough-winged Swallow	" 11	" 14	3
Summer Warbler	" 13	" 15	2
Whip-poor-will	" 14	" 18	4
Ovenbird	" 14	" 20	6
Red-eyed Vireo	" 15	" 26	8
Yellow-throated Vireo	" 15	" 21	6
Kingbird	" 17	" 24	7
Wood Thrush	" 17	" 19	2
Ruby-throated Hummer	" 18	" 22	4
Great Crested Flycatcher	" 18	" 20	2
Hooded Warbler	" 18	" 20	2
Summer Tanager	" 20	" 22	2
Catbird	" 20	" 20	0
Wood Pewee	" 24	" 29	5
Chat	" 24	" 26	2
Indigo Bird	" 28	" 30	2
Black-poll Warbler	May 3	May 5	2
Yellow-billed Cuckoo	" 3	" 4	1
Average	April 17	April 21	3.6

In addition there are three species that move much more slowly; the Yellow-throated Warbler appears at Raleigh March 26 and is not seen at Asheville until April 21, a difference of 26 days. The corresponding dates for the Maryland Yellow-throat are March 30 and April 18, a difference of 19 days. For the White-eyed Vireo the times of arrival are April 2 and April 15, a difference of 13 days. These three are all early migrants, and it is true in general that the earlier a species moves northward in the spring the slower will be its average daily advance. All three find near Asheville their highest extension into the mountains, and it is possible that this fact may account for their delayed arrival. Though when birds are migrating in a level country the opposite is true,— they migrate more rapidly as they approach the northern limit of their range.

The most interesting phase of the comparison of migration at the two localities is connected with the time of arrival of the following species:

Species.	Average of the first seen.		Difference. Days.
	Raleigh.	Asheville.	
Solitary Vireo	March 26	March 10	16
Worm-eating Warbler	April 24	April 20	4
Scarlet Tanager.	" 28	" 20	8
Black-throated Blue Warbler	" 28	" 24	4
Rose-breasted Grosbeak	May 2	" 23	9

Each of these species appears at Asheville, in the mountains, before being seen at Raleigh, on the plains. The probable explanation of this anomaly is that each of these species breeds commonly at Asheville, and rarely or never at Raleigh. There is here a striking and unexpected exemplification of the rule that *the southernmost breeding birds constitute the van in spring migration.* While the present sum of knowledge is not sufficient to warrant the statement that this rule is universal, and very likely further investigation will show some exceptions, yet the above facts furnish strong evidence in its favor.

SPRING BIRD MIGRATIONS OF 1903.

BY ELON HOWARD EATON.

BIRD migration is a very elusive subject. At least we have found it so in western New York, after trying for years to determine its times and seasons, bird routes and isopiptoses, causes and results. Even if one could be everywhere all the while at the same time, it would be difficult to run down the last factor in this complex problem. Meanwhile we are after facts.

The writer has been greatly disappointed to find how imperfect are the records of observers in determining the presence of a bird at any given station, rendering it almost impossible to draw correctly the lines of simultaneous arrival. Consequently at Roches-